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United States Department of Agriculture
Bureau of Entomology and Plant Quarantine

A POWER-DRIVEN SOIL-SIFTING MACHINE*

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Several kinds of sifting machines for separating subterranean insects from soil have been developed during the last few years. Donohoe (1) developed a foot-operated device for recovering the larvae of the raisin moth from the soil. Campbell and Stone (2) developed two sifters for use in examining soil to determine the effect of chemicals on wireworms and also to determine the wireworm population in a given area. One of these was hand-operated and one power-driven. A machine by Yothers (3) was a hand-operated sifter for determining codling moth larval populations in the soil. A hand-operated machine by Lane and Schirck (4) was used in wireworm studies. Another by Morrill (5) was a motor-driven sifter employed for determining wireworm populations in tobacco fields. A mobile, motor-driven soil sifter by Lane and Schirck (6) was employed in wireworm investigations.

The hand-operated sifter discussed by the junior writer (3) was suitable for its purpose of separating codling moth larvae in their over-wintering cocoons from soil and debris, but in order to facilitate the handling of much larger quantities and numbers of soil samples this device was transformed into a gasoline-powered machine, as shown and discussed here. The main features of this device are its low cost of construction and operation and its ease of handling and operation.

Construction

A frame of 2" x 4" lumber, 25 inches wide and 6 feet long (fig. 1, J), was built on the sawhorses (G). The 2 by 4's were notched to fit on top of the sawhorses to prevent slipping. One bolt down through the center of each sawhorse fastened the frame to it and yet made it easy to separate them. A 1" x 6" frame (I) was built on three sides of the frame (J) as a guide for the sifting box (E).

*This power-driven sifter and the hand-operated one from which it originated (see reference No. 3) were developed at the Yakima, Wash., laboratory in the course of investigations of codling moth control.

The sifting box was made with a bottom of 3/16" mesh hardware cloth. The rollers (fig. 1, F) are of round fir, 2½" in diameter and 4" long, with a 1/2" hole through the center for a bolt. A piece of 3/4" pipe and washers keep the rollers apart. The rollers turn on a smooth runway. A 2" x 4" cross piece (fig. 3, 4) was set into the end of this box just ahead of the front rollers. To this a connecting rod (fig. 1, D) (fig. 3, 3) was attached, which was fitted on the end with a U-strap (fig. 3, 5) and a bolt (fig. 3, 6) fitted with a grease cup (fig. 3, 7). As there is a great deal of wear and considerable strain here, a 1" bolt should be used as shown in figure 3, 6. The connecting rod (fig. 1, D) (fig. 3, 3) is a good piece of full 1" x 2" straight-grain oak with a 1/4" bolt through each end. The shaft is a 3/4" steel rod with a cross bar (fig. 1, C) (fig. 3, 8 and 9) on one end, 1/2" x 1-1/2", with a double set of holes for changing the length of the stroke. The boxings are fitted with grease cups to insure adequate lubrication. A bolt, 1/2" x 26", running across from one side of the main frame to the other under the drive shaft holds the frame together.

To operate this sifter a utility gasoline motor (fig. 1, A) was used, mounted on an iron frame as described by Dean (7). To this frame was bolted the extension-shaft frame (fig. 1, M), which supports the shaft, a 1-1/2" V-pulley, and a bearing. The shaft and V-pulley are connected to the engine shaft by a universal joint (fig. 3, 1). A 10" pulley mounted on the sifter is operated by a V-belt, 1/2" x 48", over the 1-1/2" pulley on the drive shaft.

The motor frame rests on two cross pieces (fig. 1, K), attached to and extending across from one beam (L) to the other, and is attached to the sifting machine frame with a bolt (B). By removing this one bolt the motor and its frame can be separated from the sifting machine. The beams (L) are also bolted to the legs of the horses to insure rigidity of the two machines.

A flexible cable shown in Dean's paper (7) was removed, and a short piece of 1/2" shafting was made square on one end and inserted in its place (fig. 3, 1 and 2). This shaft is long enough to allow attachment of a flexible cable if desired. The steel platform (fig. 1, H) is for attachment of a paint-gum compressor for spraying purposes in the field where electric power is inaccessible. The compressor is operated off the projected shaft above it. If desired, this sifter can still be used as a hand sifter by simply removing the one bolt B, thus detaching the motor and its frame from the sifting machine.

The general appearance of this machine is shown in figure 2, which is from a somewhat different angle from that shown in figure 1.

1. Donohoe, Heber C. A Treadle Sifter for Examination of Soil in Studies of Insects. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-1. February 1934.
2. Campbell, R. E., and Stone, M. W. Soil Sifters for Subterranean Insects. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-49. May 1935.
3. Yothers, M. A. A Simple Hand-Operated Soil-Sifting Device. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-134. October 1938.
4. Lane, M. C., and Shirck, F. H. A Soil Sifter for Subterranean Insect Investigations. Jour. Econ. Ent. 21 (6): 934-936. December 1928.
5. Morrill, A. W., Jr. A Sturdy but Compact Soil Sifter for Field Use. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-148. June 1939.
6. Lane, M. C., and Shirck, F. H. A Mobile Power Soil Sifter. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-70. January 1936.
7. Dean, Fred P. A Power-Driven Mixer for Making Emulsions and Other Sprays in the Field. United States Department of Agriculture, Bureau of Entomology and Plant Quarantine, ET-145. May 1939.

List of Materials

Lumber:

3 pieces 2" x 4" x 12' #1 fir S4S (surfaced 4 sides)	Frame
2 pieces 2" x 3" x 16' #1 fir S4S	Frame
1 piece 1" x 6" x 12' #2 PP. S4S (ponderosa pine)	Frame
1 piece 1" x 4" x 16' #2 PP. S4S	Screen box
1 piece 1" x 2" x 12' blind stop PP. S4S	Screen box
1 piece 1" x 2" x 8" clear oak S4S	Pitman rod
2 pieces 2" x 2" x 8" #1 fir S4S	Boxing blocks
4 pieces 2-1/2", round, 4" long	

Hardware:

Hardware cloth, 24" x 38", 3/16" mesh, galvanized
2 rods 1/2" x 25"
2 rods 1/2" x 26"
2 pieces 3/4" pipe, 15-1/4" long

2 bolts $\frac{3}{8}$ " x $5\frac{1}{2}$ ", machine
2 bolts $\frac{3}{8}$ " x $6\frac{1}{2}$ ", machine
2 bolts $\frac{3}{8}$ " x $4\frac{1}{2}$ ", machine
5 bolts $\frac{3}{8}$ " x $2\frac{1}{2}$ ", machine
2 bolts $\frac{3}{8}$ " x 1", machine
2 bolts $\frac{1}{4}$ " x $2\frac{1}{2}$ ", machine
1 piece shafting, $\frac{3}{4}$ " x 15", with crank drilled with holes for bolts

Length of shaker strokes $1\frac{1}{2}$ " to 4"

2 collars, $\frac{3}{4}$ "

2 boxings, $\frac{3}{4}$ ", complete

1 U with bolt and grease cup

1 boxing, $\frac{1}{2}$ ", complete

1 angle iron brace for motor

1 piece shafting, $\frac{1}{2}$ " x 10"

1 pulley, $1\frac{1}{2}$ "

1 collar, $\frac{1}{2}$ "

1 pulley, 10"

1 V-belt, $\frac{1}{2}$ " x 48"

Total cost, materials, less motor and motor frame, about \$11.

A POWER-DRIVEN SOIL SIFTING MACHINE.

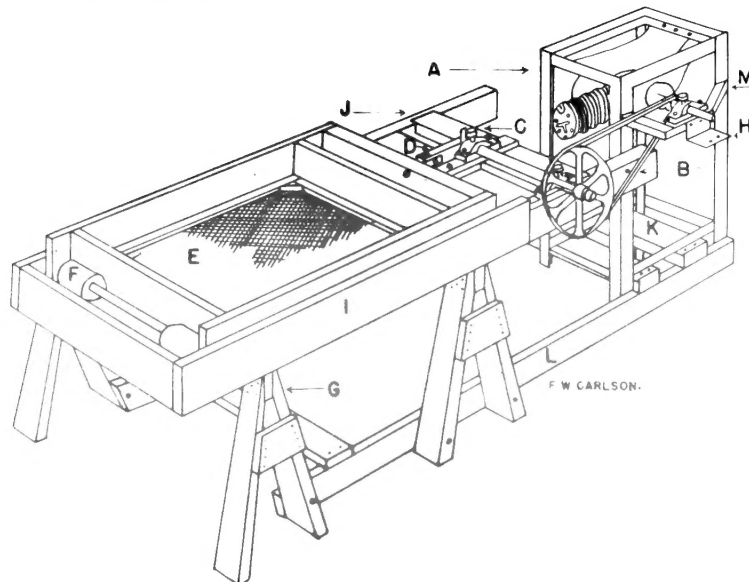


Figure 1.—Power-driven soil-sifting machine. A, Utility gasoline motor; B, bolt for attaching the motor frame to the sifter frame; C, adjustable crank with 1-1/2" to 4" stroke; D, hardwood connecting rod; E, shaker screen and frame; F, rollers; G, horses; H, platform for spray-gun compressor (when used for spraying); I, guide frame for sifter carriage; J, stationary base for sifter; K, cross pieces under engine frame; L, leg rests and motor support; M, extension-shaft frame.

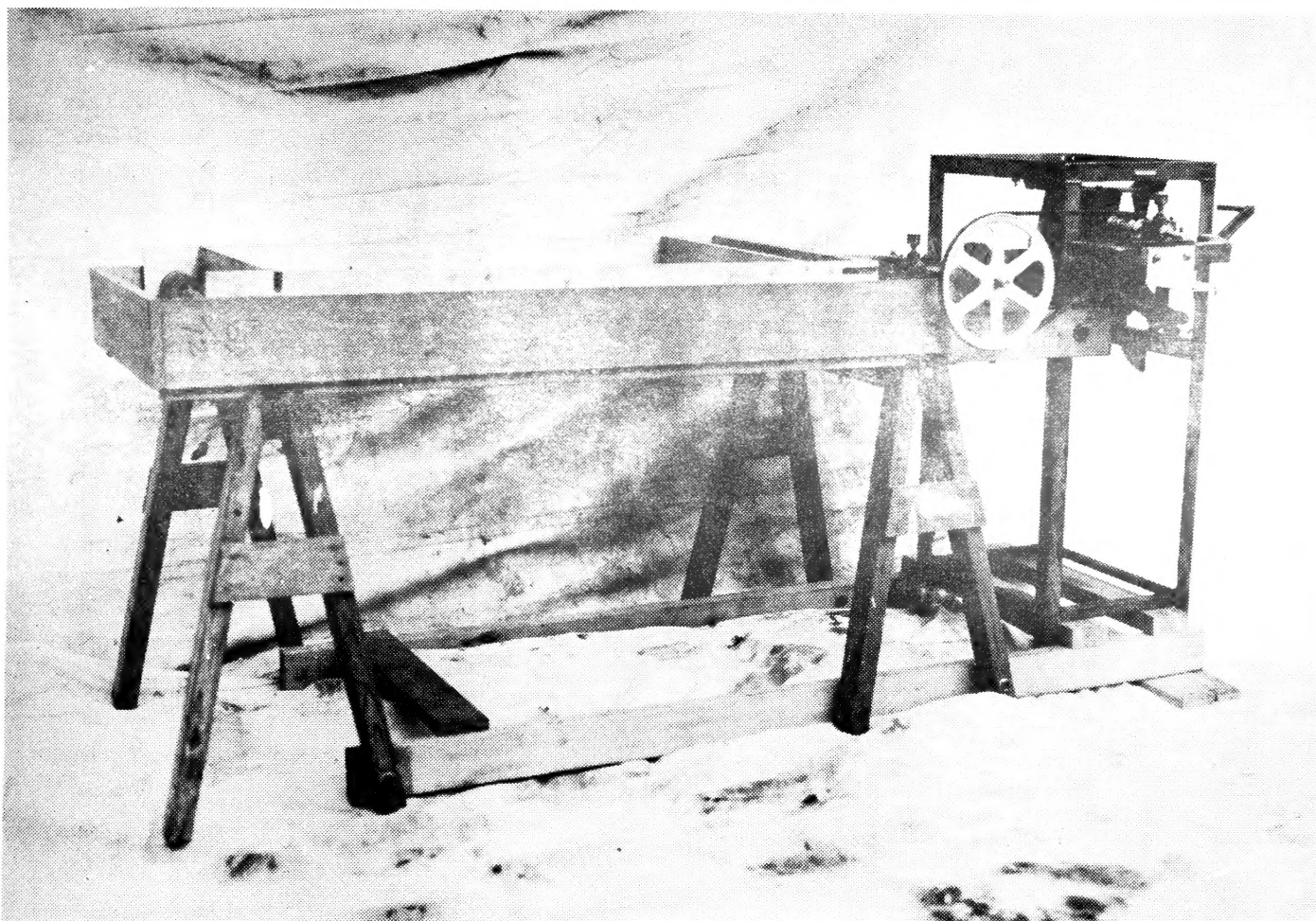
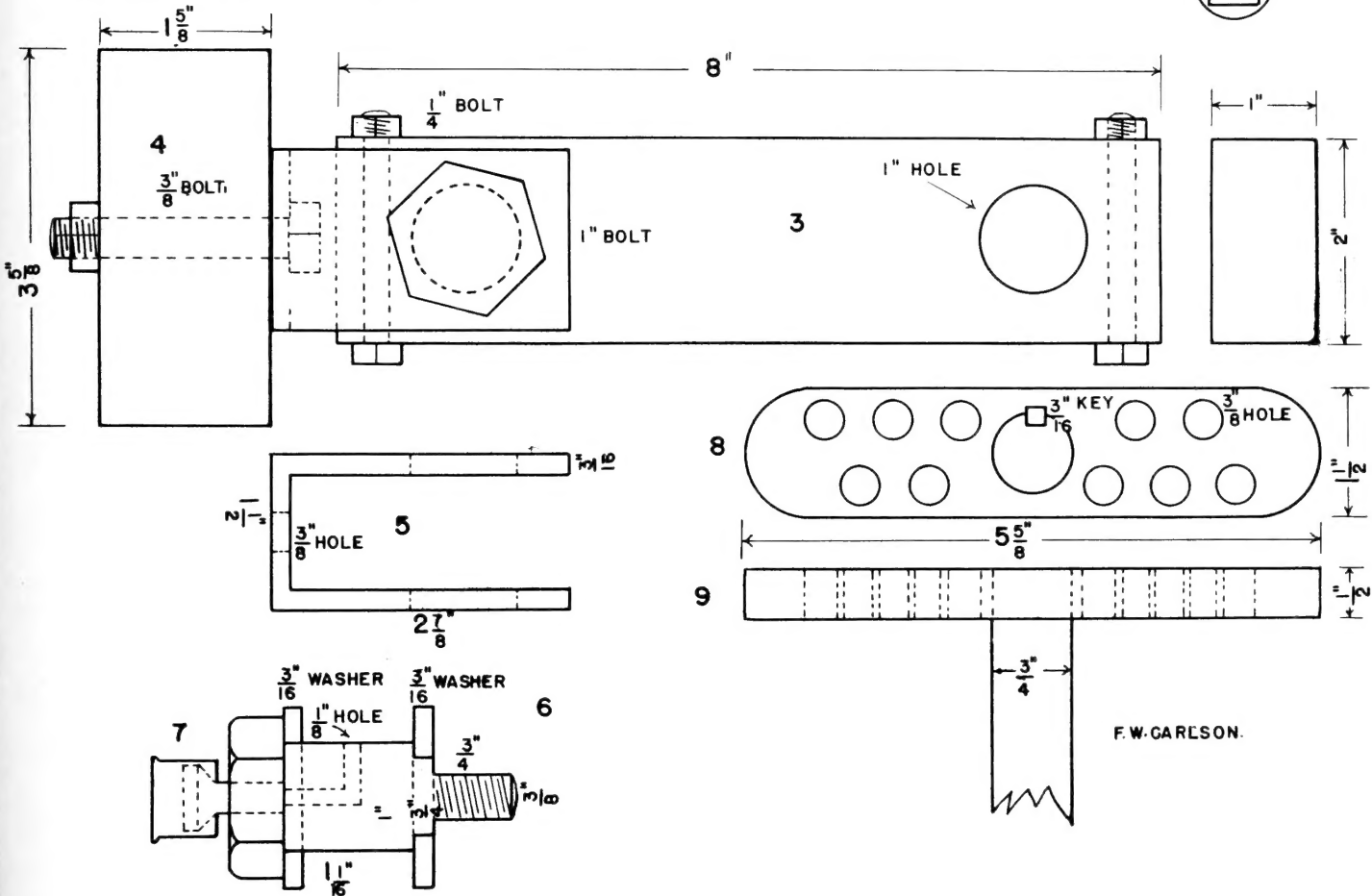
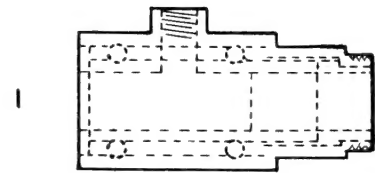


Figure 2.--Soil-sifting machine from a somewhat different angle from that shown in figure 1.

FIG. 3.

- 1-THE UNIVERSAL JOINT WITH FLEXIBLE WIRE CABLE REMOVED.
- 2-SQUARE SOCKET FOR DRIVE SHAFT.
- 3- CONNECTING ROD.
- 4- CROSS PIECE ON SIFTER.
- 5- U-STRAP.
- 6- CRANK BOLT.
- 7- GREASE CUP.
- 8- CRANK ON SHAFT WITH HOLES FOR ADJUSTING STROKE.
- 9- SIDE VIEW OF CRANK.



SCALE 1" TO 1"

CRANK ASSEMBLY & UNIVERSAL OF SIFTING MACHINE.

